

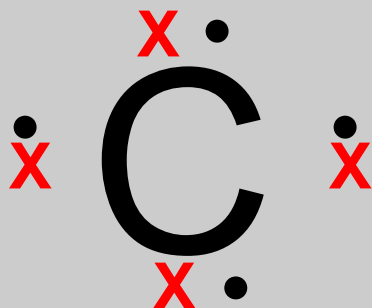
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# Carbon & Organic Chemistry

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Grade 10

## Carbon Atom



Carbon is able to form **4 covalent** bonds (4 **valence** electrons) with other carbon or other elements.

# Organic Compounds

- \_\_\_\_\_ **Compounds** - any covalently bonded compound containing carbon (except \_\_\_\_\_ , \_\_\_\_\_ and \_\_\_\_\_ )
- \_\_\_\_\_ - Organic compounds that contain only carbon & hydrogen
- \_\_\_\_\_ - contain only single covalent bonds
- \_\_\_\_\_ - contain one or more carbon - carbon double bond
- \_\_\_\_\_ - contain one or more carbon-carbon triple bond

# Saturated & Unsaturated Hydrocarbons



- Saturated hydrocarbons – contain only \_\_\_\_\_ carbon-carbon bonds (\_\_\_\_\_)
- Unsaturated hydrocarbons – contain double carbon-carbon bonds (\_\_\_\_\_) or triple carbon-carbon (\_\_\_\_\_) bonds

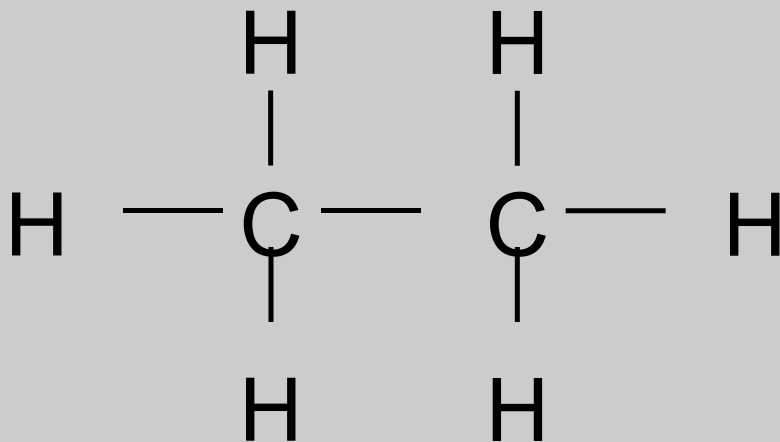
# Formulas

- Alkanes =  $C_n H_{2n+2}$
- Alkenes =  $C_n H_{2n}$
- Alkynes =  $C_n H_{2n-2}$

# Functional Groups

| Class           | Functional group   |
|-----------------|--|
| Alcohol         | $R - OH$   |
| Ether           | $R - O - R'$   |
| Aldehyde        | $\begin{array}{c} O \\    \\ R - C - H \end{array}$      |
| Ketone          | $\begin{array}{c} O \\    \\ R - C - R' \end{array}$     |
| Carboxylic acid | $\begin{array}{c} O \\    \\ - C - OH \end{array}$       |
| Ester           | $\begin{array}{c} O \\    \\ R - C - O - R' \end{array}$ |
| Amine           | $\begin{array}{c} R' \\   \\ R - N - R'' \end{array}$    |

- Only carbon and hydrogen
- All single bonds

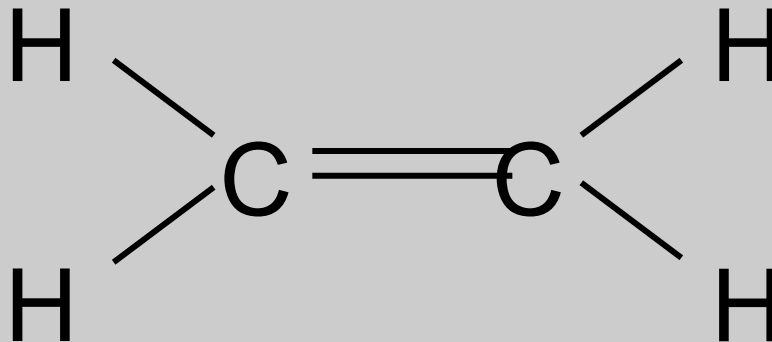


**Q:** What should you call **cyclic** hydrocarbons made up of just single bonds?

**A: Cycloalkanes**

# Alkenes

- Only carbon and hydrogen
- A carbon to carbon double bond

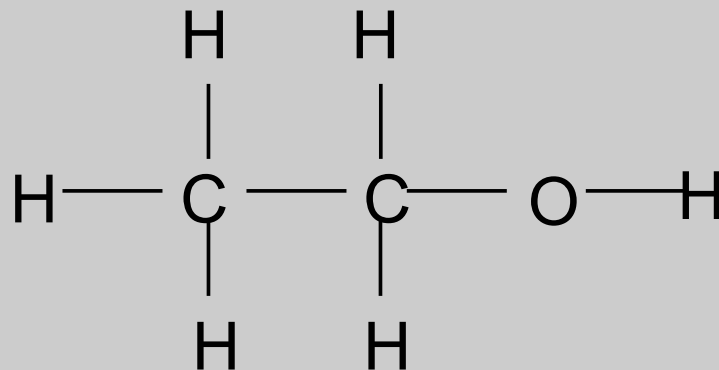


**Q:** What should you call a molecule with **two** C=Cs?

**A:** A **diene**



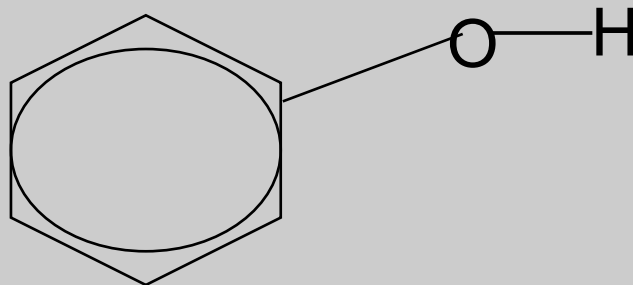
- Only one oxygen
- Has an **O-H** group
- Can classify as  $1^\circ/2^\circ/3^\circ$  according to position of O-H group on carbon skeleton



**Q:** Why are short-chain alcohols so soluble in water?

**A:** They can form **hydrogen bonds** with  $\text{H}_2\text{O}$  molecules

- Only one oxygen
- Has an **O-H** group
- The O-H group is **directly** attached to a benzene ring

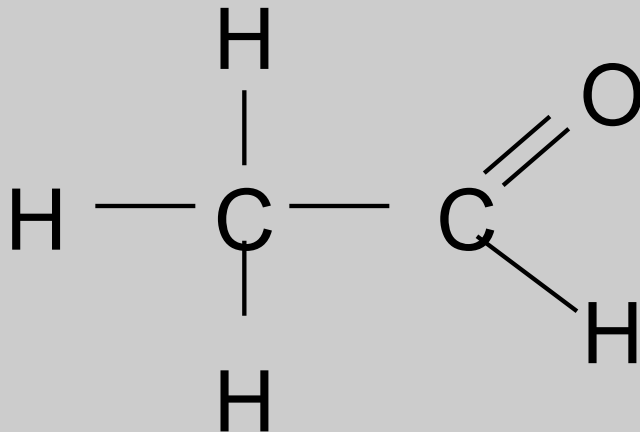


**Q:** The  $\text{C}_6\text{H}_5$ - group has a special name. What is it?

**A:** Phenyl

# Aldehydes

- Only one oxygen
- Has a **C=O** group
- C=O group is at the **end** of carbon chain, so is next door to a **hydrogen** atom

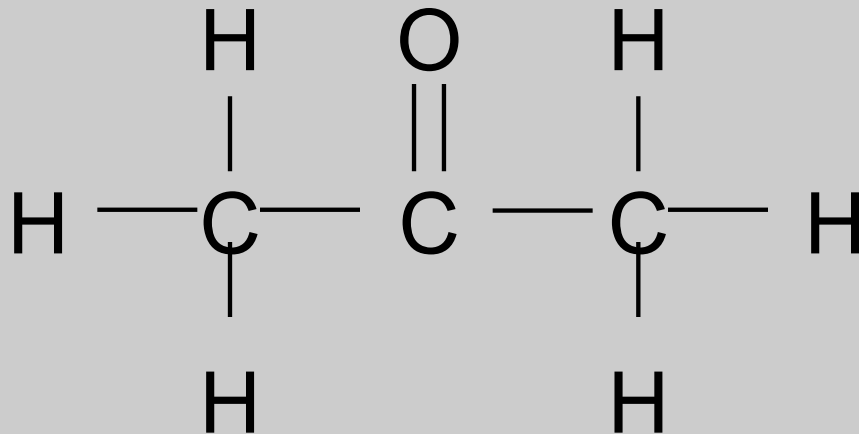


**Q:** Aldehydes can be easily oxidised to form ...?

**A:** Carboxylic acids

# Ketones

- Only one oxygen
- Has a **C=O** group
- C=O group is **not** at the end of carbon chain, so is next door to **2 carbons**



**Q:** Ketones cannot easily be oxidised. Why not?

**A:** No hydrogen atom attached to the C=O group.

# “What family...?” quiz

## Family names:

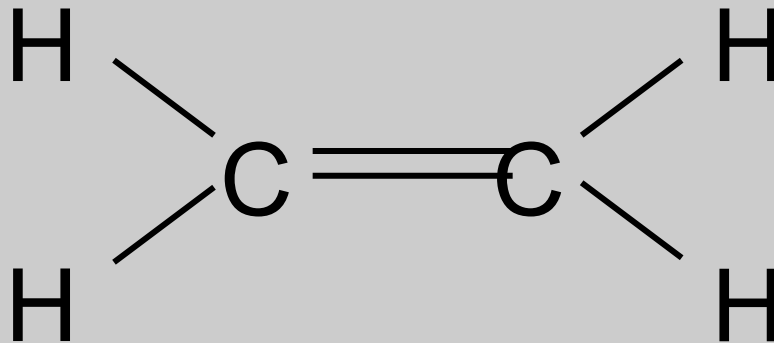
- cycloalkane
- alkene
- primary ( $1^\circ$ ) alcohol
- secondary ( $2^\circ$ ) alcohol
- tertiary ( $3^\circ$ ) alcohol
- phenol
- aldehyde
- ketone
- carboxylic acid
- ester
- ether

... are you ready?

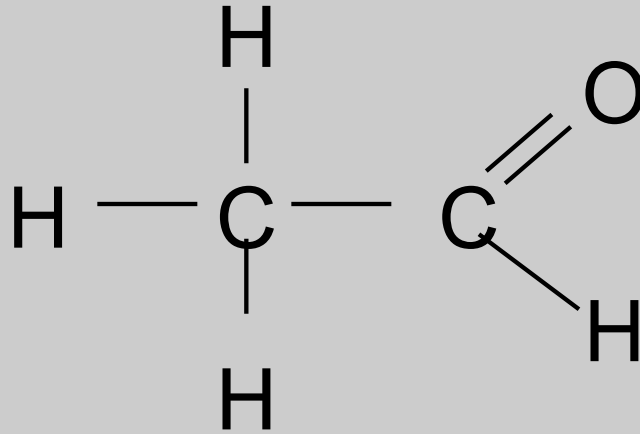
5 ... 4 ... 3 ... 2 ... 1 ...

**GO!**

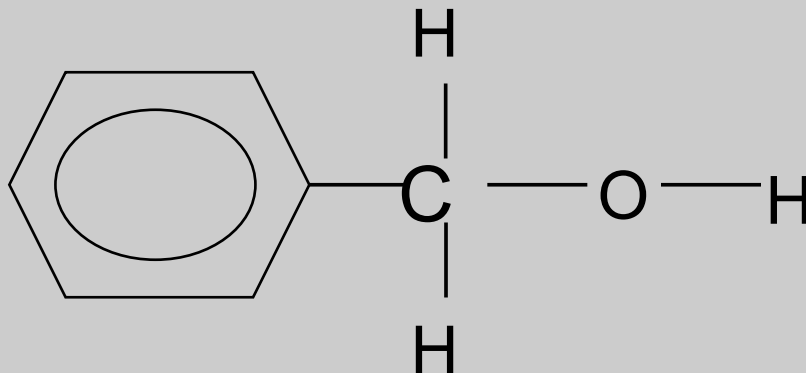
# What family does it belong to? (1)



# What family does it belong to? (2)

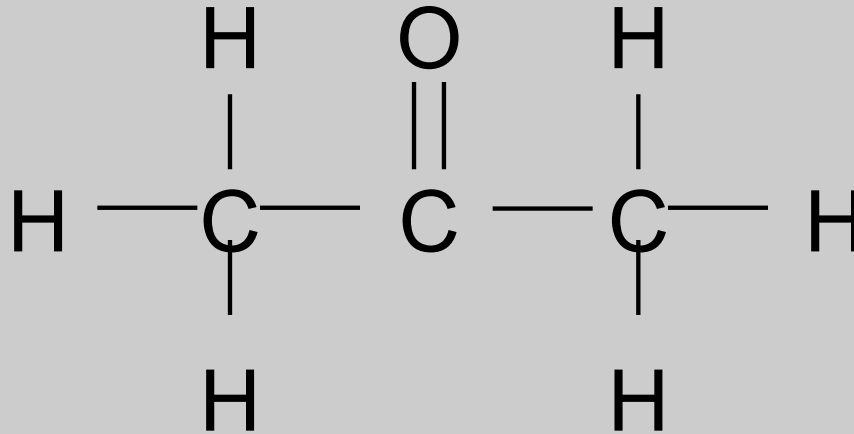


# What family does it belong to? (3)

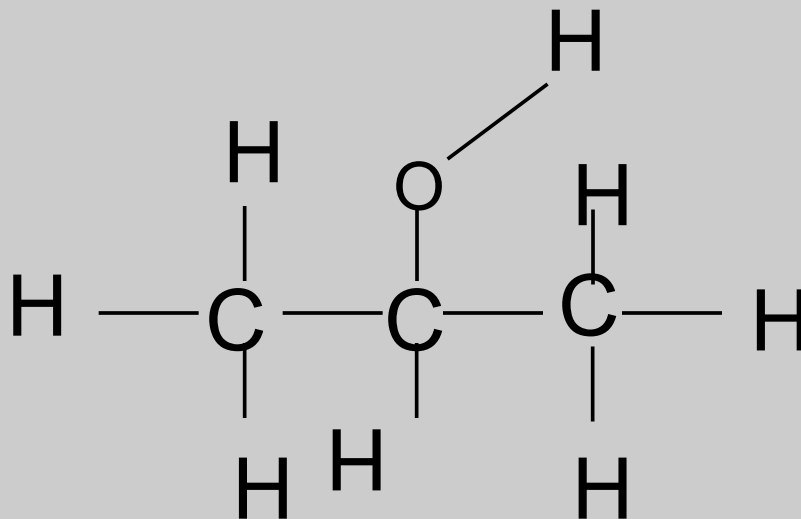




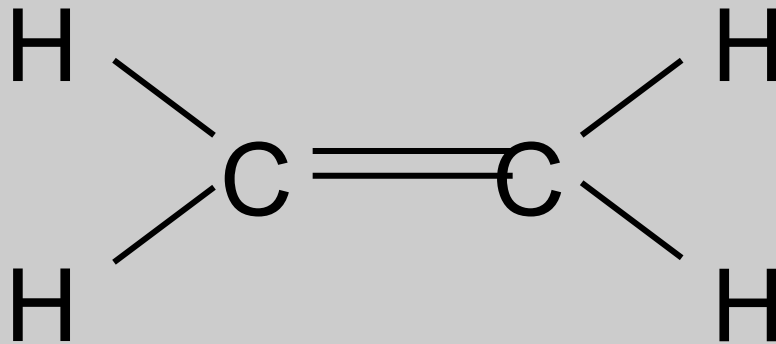
# What family does it belong to? (4)



# What family does it belong to? (5)

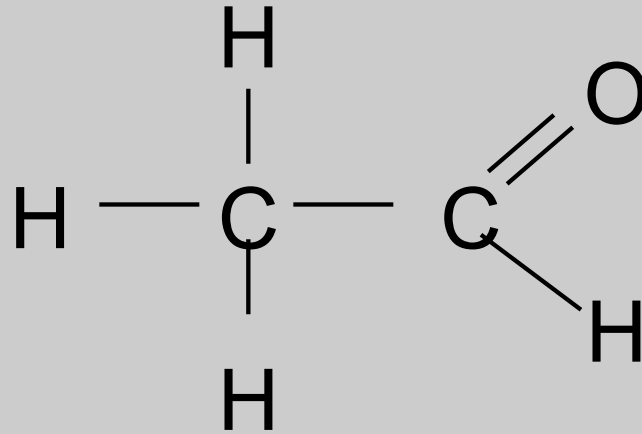


Answers: (1)



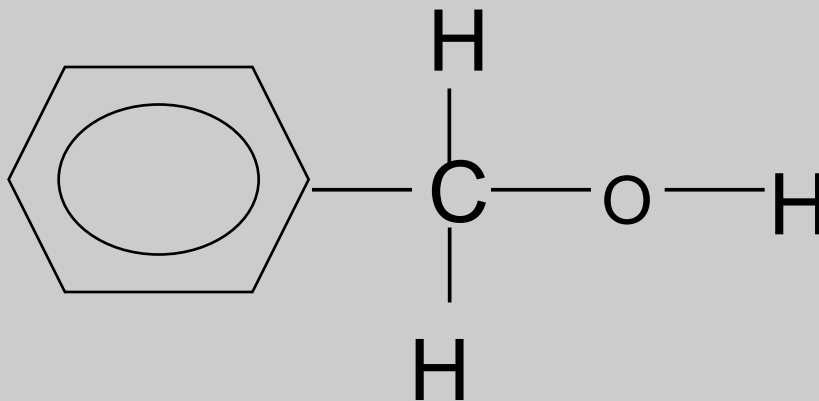
alkene

Answers: (2)



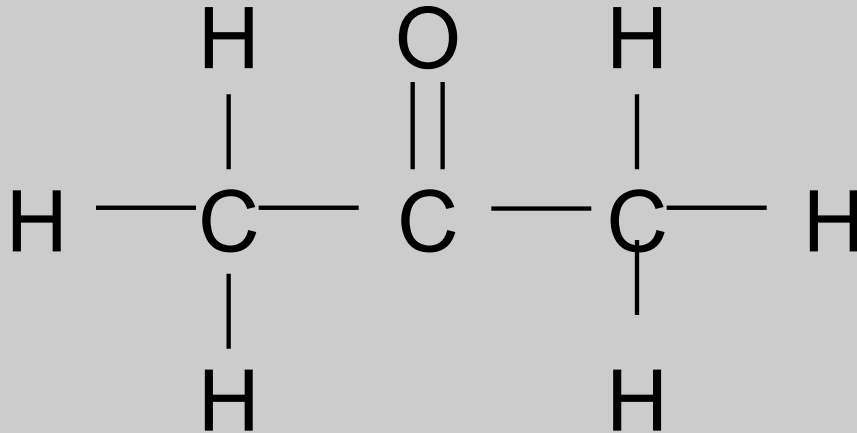
**aldehyde**

Answers: (3)



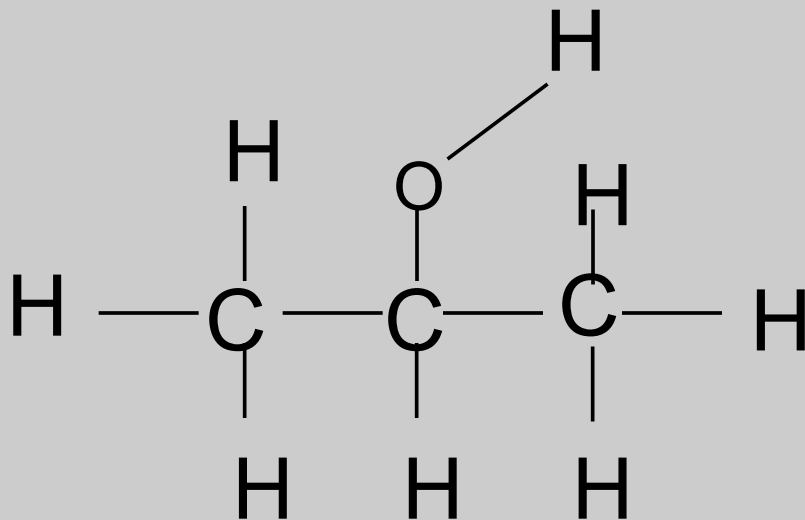
**primary alcohol**

Answers: (4)



ketone

Answers: (5)



**secondary alcohol**

# Naming an Organic Compound- IUPAC

If I told you that I met a woman with a 4-part name and asked YOU to put the parts in order, I bet you'd get it on the first attempt.

Try it

- Jane
- Jr
- Doe
- Miss

Does your attempt look like this: **Miss Jane Doe Jr ?**

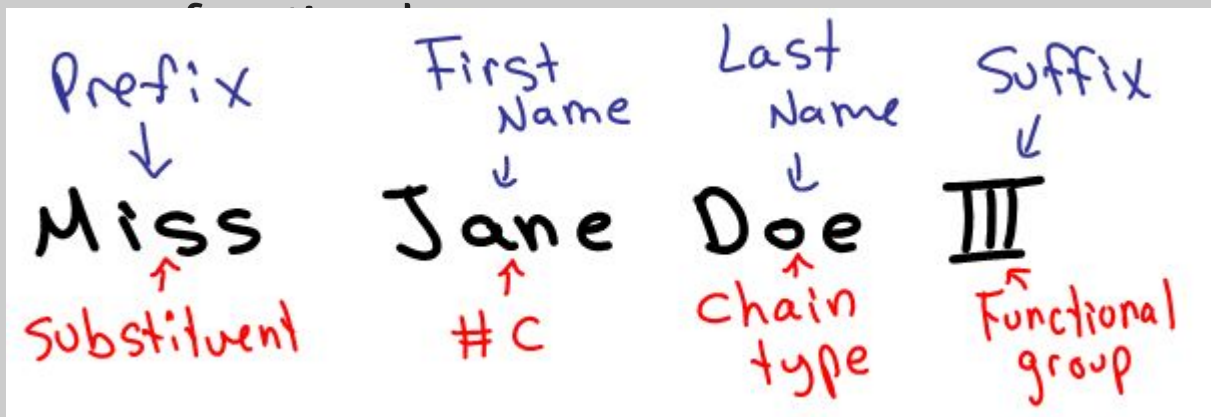
Miss Jane Doe Jr breaks down as follows:

- Prefix = Miss
- First Name = Jane
- Last Name = Doe
- Suffix = Jr

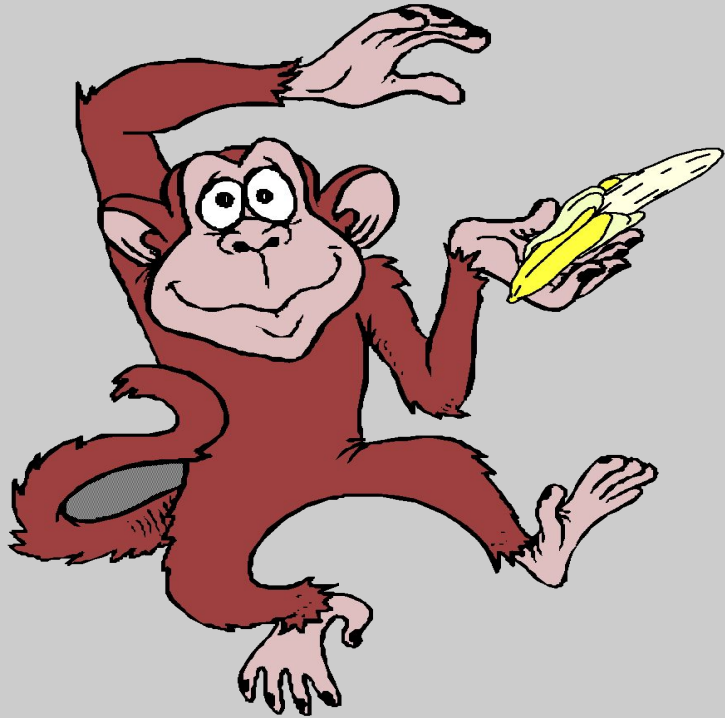


# Organic Compounds Follow a Similar Naming Pattern

- Prefix = substituent
- First Name = carbon chain number
- Last Name = type of chain
- Suffix = highest priority



# Mnemonic for First Four Prefixes



## First four prefixes

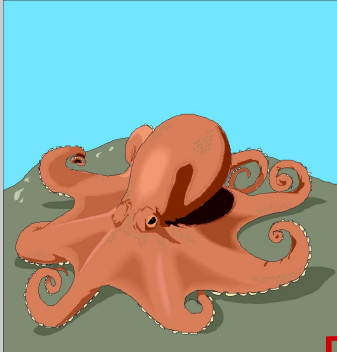
- Meth-      Monkeys
- Eth-      Eat
- Prop-      Peeled
- But-      Bananas

# Nomenclature

- Must memorize prefixes
- To name, look at the formula for the hydrocarbon
- Determine if it is an alkane, alkene, or alkyne
- Use the prefix for the number of carbons
- Add ending (ane, ene, yne)

| <b>Prefix</b> | <b># of carbon atoms</b> |
|---------------|--------------------------|
| Meth-         | 1                        |
| Eth-          | 2                        |
| Prop-         | 3                        |
| But-          | 4                        |
| Pent-         | 5                        |
| Hex-          | 6                        |
| Hept-         | 7                        |
| Oct-          | 8                        |
| Non-          | 9                        |
| Dec-          | 10                       |

# Other Prefixes

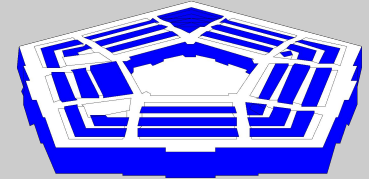


Decade

Decimal

Decathlon

- Pent-
- Oct-
- Dec-
- Hex-, Hept-, Non-



# Self study link for IUPAC

[https://www2.southeastern.edu/Academics/Faculty/wparkinson/help/organic\\_chemistry/test.html](https://www2.southeastern.edu/Academics/Faculty/wparkinson/help/organic_chemistry/test.html)

<https://orgchem101.com/nom/en/>

After you refer this pdf....there are some practice worksheet

